

C. Follow-up

Pollution abated (date) 6/19/96 3:15 PM (limited to personal observations) by (action): Aerial Surveillance
The Lake water, outside the containment boom, was clear, there were no evidence of discoloration.

Aerial surveillance of Lake Michigan shoreline from the Chicago MSD to Michigan City, show no evidence of discoloration in the lake waters and the Lake shore lines..

Re-inspection dates: We will need to obtain copies of the video taken from both the surface & aerial surveillance 6/18 & 6/19/ 1996.

Findings: In compliance with 327 IAC 2-6-1 & 327 IAC 2-6-2 Rule 6. Spills into Waters of the State
Violations of NPDES Permit Limits Outfall 001: TSS 14,348 #s (limits 5694 #s), O&G 6569 #s (limits 2600 #s), COD 156,282 #s, (limits 58427 #s), Phenol & Ammonia are within permit limits.

Other action taken:

Signature: 

D. Referred To: IDEM-OER, IDEM-OE, IDEM-OWM

0088b

IDEM

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

NPDES Compliance Inspection Report

100 North Senate Avenue
P.O. Box 6015
Indianapolis, IN 46206-6015

Section A: National Data System Coding

Transaction Code	NPDES	yr/mo/day	Inspection Type	Inspector	Fac Type
101 251	IND000108	960619	IR	195	202

Remarks

NOT IN COMPLIANCE WITH NPDES PERMIT LIMITS.

31	Reserved	Facility Evaluation Rating	BI	QA	Reserved	66
67	69	70	71	72	73	74

Section B: Facility Data

Name and Location of Facility Inspected

AMOCO Petroleum Oil Co
2185 INDIANAPOLIS BLVD.
WHITING, IN 46394

Entry Time 930 AM PM

Permit Effective Date

Receiving Waters / POTW

Permit Expiration Date

LAKE MICHIGAN

2-28-95

Name(s) of On-Site Representative

SPIN BALCO

Title(s)

Team Leader WATER

ENVIRON. AFFAIRS

Phone No(s)

(219)

473-7700

Name, Address of Responsible Official

DON WILSON

Title

Plant mgr

Phone No.

(219) 473-7700

Contacted

☐ Yes☒ NO

Section C: Areas Evaluated During Inspection

(S = Satisfactory, M = Marginal, U = Unsatisfactory, N = Not Evaluated)

3	Permit	N	Flow Measurement	N/A	Pretreatment	N	Operations & Maintenance
5	Records/Reports	N	Laboratory	N	Compliance Schedules	N	Sludge Disposal
M	Facility Site Review	(1) N	Effluent/Receiving Waters	N	Self-Monitoring Program	N	Other: Reported Spill

Section D: Summary of Findings/Comments (attach additional sheets if necessary)

* Reported spill in compliance with 327 IAC 2-6-1 Rule 6.

- (1) Effluent/Discharge from permitted outfall 001 is TURBID, DISCOLORED, TAN/BROWN color. Slight Brown colored foam & minimal amount of oil sheen was observed floating along the shoreline, proximal to 001 AND within the containment Boom.
- (2) Containment Booms were in place
- (3) Vacuum trucks were actively skimming/removing surface water within the containment Boom.
- (4) Surface vessels were also observed outside the containment Boom conducting dispersion of floating solids.
- (5) Surface & Aerial surveillance shows ~~discoloration~~ a column of discolored material outside of the containment Boom

Name(s) and Signature(s) of Inspector(s)

Edna Depina

AT Ken/Rhame IDEM-OER

Agency/Office/Telephone

IDEM-OWM

Date

6-18-19-96

Signature of Reviewer

Agency/Office/Telephone

Date

Regulatory Office Use Only

Action Taken

Date

Compliance Status

☐ Non compliance
☐ Compliance



INDUSTRIAL INSPECTION

State Form 35969 (R2/2-94)

- ☐ Satisfactory
☐ Marginal
☒ Unsatisfactory

Indiana Department of Environmental Management
Office of Water Management
105 S. Meridian Street
Indianapolis, Indiana 46225

Name of inspector: E. DEPOSITAR
Date (month, day, year): 6-18-19-96

Name of company: Amoco Petroleum oil Co.
Address of company (street and number or Rural Route): 2815 INDIANAPOLIS, BLVD.
City: WHITING, IN County: LAKE Telephone number: (219) 473-7700
ZIP code: 46394 Name of responsible official: DON WILSON, Plant mgr
Name(s) of individual(s) contacted: SHU BALOO, ENVIRON & Safety officer, Pete BERONIO, ENVIRON Eng.
Permit number: IN0000108 Name of receiving stream and/or POTW: LAKE MICHIGAN
Type sewage disposal: Hammond POTW Name of certified operator: George Cook Lakefront WWTP
Number of employees: 1300 Class: Class 'D' INDUST WWTW Number:

Type of inspection:
☐ O & M ☐ CEI ☐ CSI ☐ Follow-up ☐ Pretreatment
☐ Other (specify) Recall - Response to Amoco spill
☐ Products oil Refinery

Outfall	Water Use	Treatment	Waste Flow	Appearance
001	oil Refinery	see WWTP	22.7 MGD	Turbid, Tan/
	Process wastes	flow scheme		Brown color -
	+ storm water			minimal foam
				oil sheen

Other water uses:

		EFFLUENT DATA mg/l (lb/d)				
Parameter	* Flow	NH ₃	TSS	Oil	COD	Phenol
Permit Limits						
Daily Max.	Reported	2060	5694	2600	58427	73.01
Daily Avg.		1030	3646	1368	3032.3	20.33
Actual Data						
Daily Max.	22.7 MGD	343	114348	6569	156,282	2.46
Daily Avg.						

Period covering:

6-18/96

Comments:

Parameter Reports and samples collected During
Hydraulic Loading/WWTP upsets
1/2 lost to 10% Active Sludge
TOO/F 001

THIS IS AN ACTUAL EVENT.

Event Log

Incident: Whiting IN USA Release/Spill 'Release Of Unknown Quanti'
Incident Date: 06/18/96
Status as of: 06/19/96 01:26 PM Entered by: CHX X Crisis2

Status as of: 06/19/96 02:50 PM
Event Name: Release/Spill to Lake Mich. 6/18 - 3 P.M. CONTINGENCY PLAN 6/19
Categories: Other Organization: Operations Section
Event Description:

CONTINGENCY PLAN SPILL RESPONSE - AFTER 3 P.M. 6/19/96
- Leave containment boom around outfalls until weather stable
- Call AllWaste to secure vacuum trucks (219-659-5455) 1 truck = 30 min. response; additional trucks = 1-1/2 hour response in the event permit violation at outfall
- In the event material is outside containment boom - contact Superior; call 1-800-688-4006; 1 hr. response time for next 48 hours; for immediate response (tugs and boom 1000'); 3 hr. response for additional boats, crew, boom, etc.

THE PLAN

- Gain storage capacity
- Overall long term compliance
- Recover activated sludge ?

WHAT HAPPENED

- No Rain
- Turbidity Down ≈ 30 ppm
- Resume normal flow at midnight after capacity capability was built so ASP could recover
- Lost sick bugs to lake during upset, healthy bugs settled, lowering solids to lake
- Modifications/improvements of WWTP. Helped quick recovery
 - O₂ addition
 - Clarifier ring
- Efforts upstream
 - Units control
 - Water shedding plan
 - Holding H₂O back

6-18-96
Ammonia 1.8 ppm
TSS 604 ppm $\approx 114,000$ #
 $\approx 10\%$ of Sludge inventory
of 1mm

Hard Dry weather 12-14 mgd
Wet weather 20-25 mgd

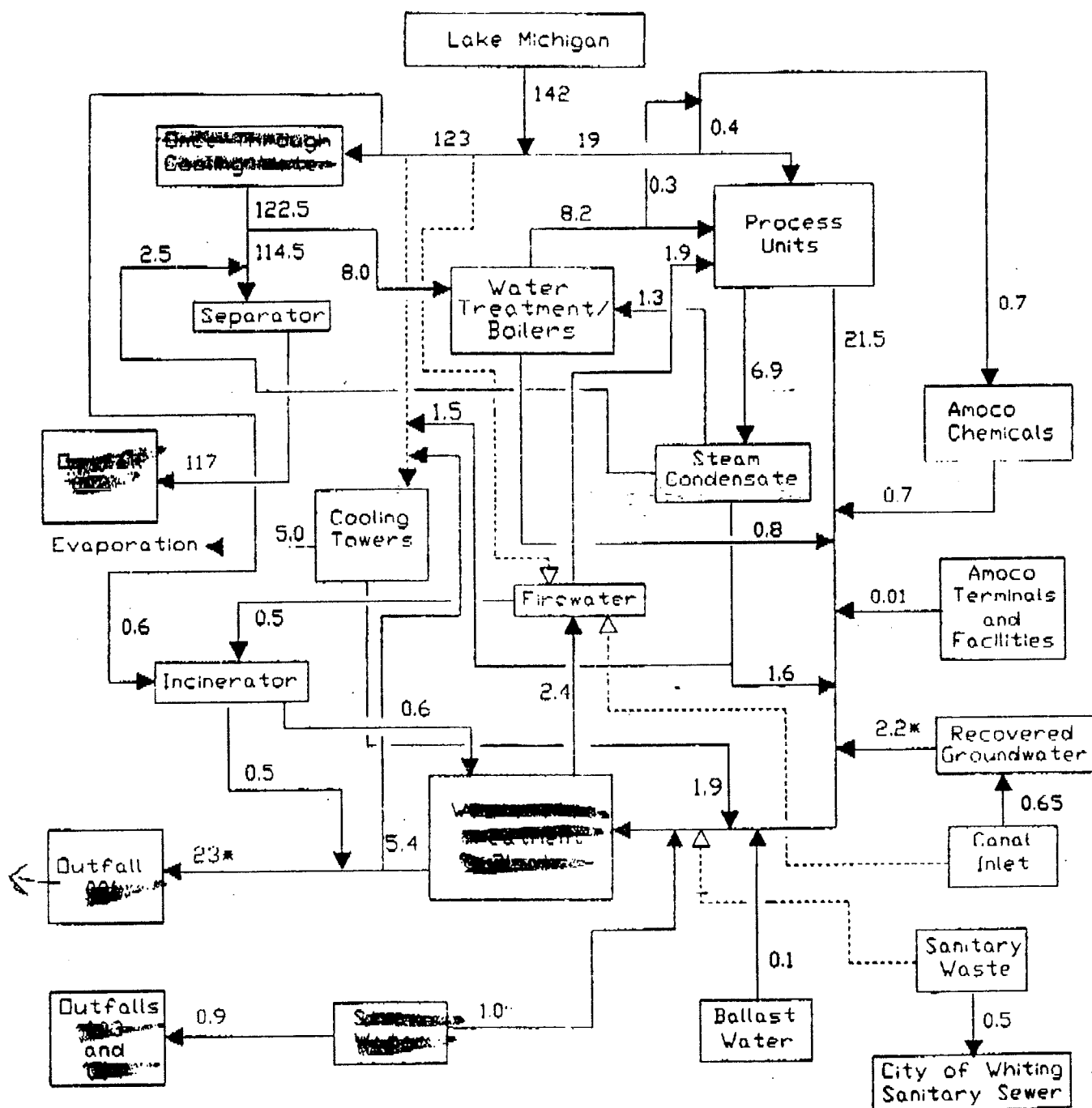


**AMOCO RELEASE/SPILL TO LAKE MICHIGAN
JUNE 18, 1996**

**GENERAL CONTINGENCY PLAN
AFTER 3:00 P.M. -- JUNE 19, 1996**

1. Cover stormwater drains and slow water flow
2. Continue water shedding
3. Control discharge of oil, ammonia, and amine from units
4. Allow bug plant to recover
5. Process water from storage tanks
6. Use storage capacity in tanks appropriately

Amoco Oil Company Whiting Refinery
Water Flow Diagram
(Flows in Million Gallons per Day)



* This flow might increase depending on groundwater recovery.

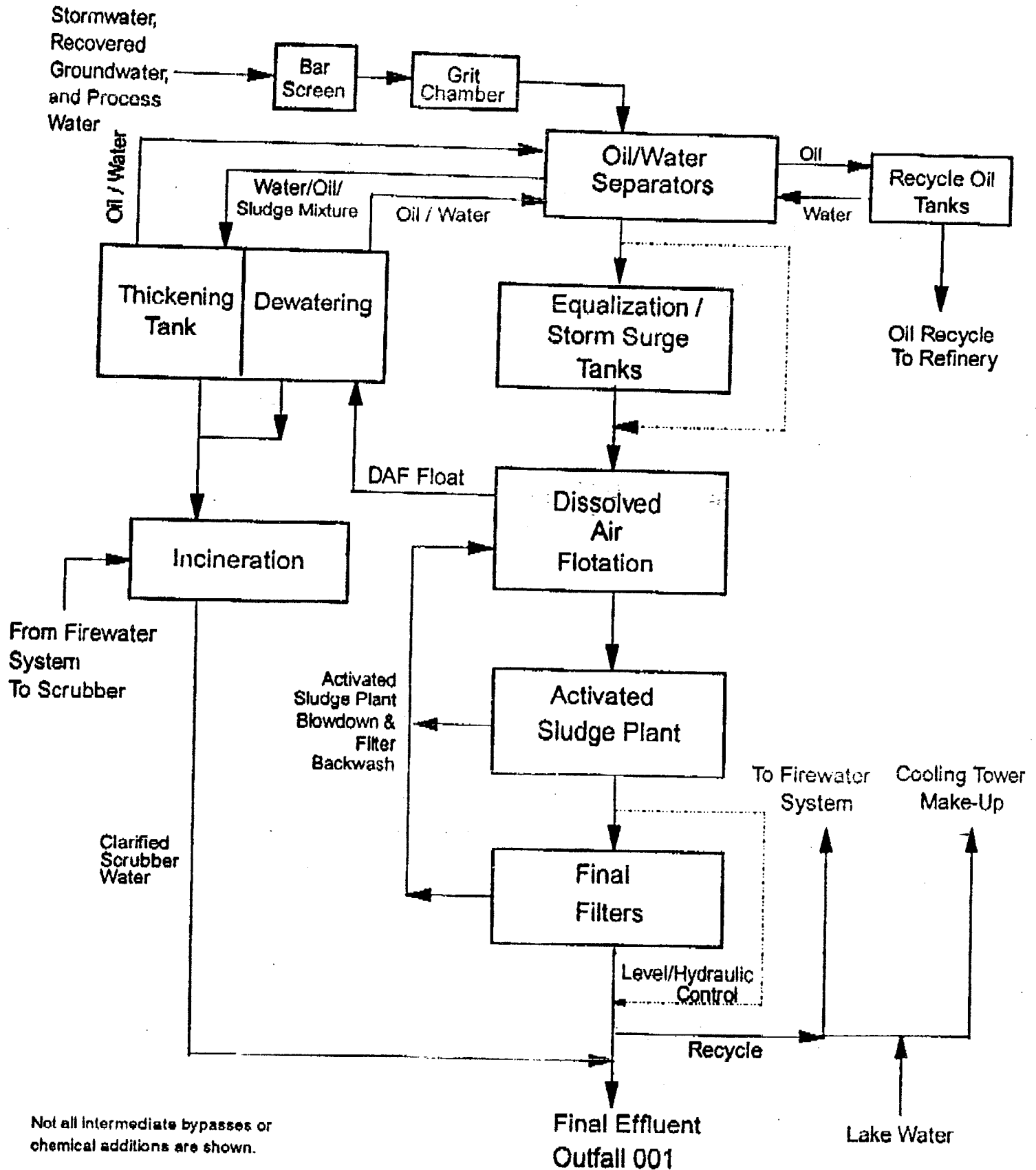
LEGEND

..... Lines available, but not normally used.

08/16/94
DRC

Wastewater Treatment Plant - Water Flow Diagram

Amoco Oil Company - Whiting Refinery



Page 2 of 21
Permit No. IN 0000108

TREATMENT FACILITY CLASSIFICATION

The discharger has a Class D industrial wastewater treatment plant, classified in accordance with 327 IAC 8-12, Classification of Water and Wastewater Treatment Plants.

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

- During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge from Outfall 001. Such discharge shall be limited and monitored by the permittee as specified below:

Discharge Limitations

Parameter	Quantity or Loading			Quality or Concentration [1]			Monitoring Requirements	
	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow	Report	Report[2]	MGD	—	—	—	Daily	Continuous
BOD ₅	4161	8164	lbs/day	Report	Report	mg/l	5 X Weekly	24 Hr. Comp.
TSS	3646	5694	lbs/day	Report	Report	mg/l	5 X Weekly	24 Hr. Comp.
COD	30323	58427	lbs/day	Report	Report	mg/l	3 X Weekly	24 Hr. Comp.
Oil and Grease	1368	2600	lbs/day	Report	Report	mg/l	5 X Weekly	Grab [3]
Phenolics (4AAP)	20.33	73.01	lbs/day	Report	Report	mg/l	3 X Weekly	24 Hr. Comp.
Ammonia as N	1030	2060	lbs/day	Report	Report	mg/l	5 X Weekly	24 Hr. Comp.
Sulfide	23.1	51.4	lbs/day	Report	Report	mg/l	1 X Weekly	24 Hr. Comp.
Total Chromium[4]	23.9	68.53	lbs/day	Report	Report	mg/l	1 X Weekly	24 Hr. Comp.
Hex. Chromium[4]	2.01	4.48	lbs/day	Report	Report	mg/l	5 X Weekly	Grab
Fecal Coliform[5]	—	—	—	Report	0.05	mg/l	5 X Weekly	Grab
Residual Chlorine[5]	—	—	—	Report	Report	pg/l	4 X Yearly	24 Hr. Comp.
2378-CDD [6]	—	—	—	Report	Report	pg/l	4 X Yearly	24 Hr. Comp.
2378-CDF [6]	—	—	—	Report	Report	ug/l	2 X Yearly	24 Hr. Comp.
Total Selenium	—	Report	lbs/day	—	Report	—	—	—

- The permittee shall begin reporting the effluent concentration of the parameters listed above which require reporting only as soon as possible but no later than three months after the effective date of the permit.
- The daily maximum flow shall be reported as the highest total daily flow for each monthly reporting period.
- Three Grabs Per 24 Hours (Oil & Grease)--Three individual samples taken at equally spaced time intervals during a 24-hour period. Each sample is individually analyzed and the arithmetic mean of the concentrations reported as the value for the 24-hour period. The number of grab samples taken in a 24-hour period may be reduced to one per day after a six month period after the effective date of the permit, if the effluent shows no violations of the oil and grease limitations listed above. At the end of the six month sampling period, the permittee may request, in writing, a review of these requirements. Upon review by the IDEM, the permit may be modified, after public notice and opportunity for hearing, to reduce the number of grab samples taken in a 24-hour period.



**CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

**Amoco Petroleum Products
Refining Business Group
Whiting Business Unit**

2815 Indianapolis Boulevard
Post Office Box 710
Whiting, Indiana 46394-0710
219-473-7700

July 3, 1996

Mr. Gary Starks
Indiana Department of Environmental Management
Office of Water Management
105 South Meridian Street
Indianapolis, IN 46206-6015

Dear Mr. Starks:

**NPDES Permit No. IN 0000108
Exceedance of Discharge Parameters at Outfall 001-Addendum**

This letter serves as a follow-up to our written notification to the Indiana Department of Environmental Management on 24 June 1996 concerning the exceedance of discharge parameters at Outfall 001 on 18 June 1996. It was stated that the daily maximum permit limit for Biochemical Oxygen Demand (BOD) was very likely to be exceeded that day; however, at that time the BOD results were unavailable. The analytical result for BOD became available on the afternoon of Monday, 1 July 1996. The discharge loading for BOD on 18 June 1996 was 180,988.01 pounds, which exceeds our maximum daily permit limit. The exceedance for this parameter was limited to 18 June 1996. The discharge met all permit limits starting Wednesday, 19 June 1996, as documented by subsequent analytical testing.

The refinery has an excellent record in maintaining compliance with its NPDES permit. This exceedance is only the second exceedance since 1984 for a process parameter. We take great pride in this record and have constantly made process and operational improvements at our wastewater treatment plant and in upstream control at the units. We do not expect further permit limit exceedances from this Outfall. We will continue to review the incident and take appropriate steps if necessary to prevent its recurrence. If you have any questions or would like additional information, please contact me at 219-473-3740.

Sincerely,

Shiv Baloo / EGF

Shiv Baloo
Team Leader-Water

JUL 8 1 34 PM '96

OFFICE
OF
WATER
MANAGEMENT
IDEM

cc: Petty Officer Meade (USCG)
Ken Rhame (IDEM)
Jan Henley (IDEM)
Eddy Depositari (IDEM)

OFFICE
OF
WATER MANAGEMENT
IDEM
JUL 8 1 34 PM '96

P-File

**GROUNDWATER EVALUATION REPORT
FOR THE
AMOCO PIPELINE XYLENE SITE *Whiting*
AMOCO CORPORATION
HAMMOND, INDIANA**

JUNE 1996

PROJECT NO. 89-049-4-001-50

**BURNS & McDONNELL WASTE CONSULTANTS, INC.
ENGINEERS-GEOLOGISTS-SCIENTISTS
KANSAS CITY, MISSOURI**

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2	Soil Analytical Results
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*Note: All tables immediately follow the text of this study plan.

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*Note: All figures immediately follow the tables of this study plan

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LIST OF ABBREVIATIONS AND ACRONYMS

AQAP	Analytical Quality Assurance Manual
ASTM	American Society for Testing and Materials
bgs	below ground surface
BMWCI	Burns & McDonnell Waste Consultants, Inc.
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
C	Celsius
CFR	Code of Federal Regulations
DOT	Department of Transportation
DQORRA	Data Quality Objectives for Remedial Response Activities - Development Process
ERB	Equipment Rinsate Blank
F	Fahrenheit
FPX	Free Phase Xylene
HPLC	High Performance Liquid Chromatography
HSA	Hollow Stem Auger
ID	Internal Diameter
IDW	Investigation Derived Waste
ITS	Inchcape Testing Services
LQAM	Laboratory Quality Assurance Manual
mg/kg	Milligrams per Kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NFGO	National Functional Guidelines for Organic Data Review
OD	Outside Diameter
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PID	Photoionization Detector
ppmv	Parts per million by volume
PVC	Polyvinyl Chloride
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
SHSP	Site Health and Safety Plan
µg/L	Micrograms per Liter
µg/kg	Micrograms per Kilogram
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WP	Work Plan

* * * * *

1.0 INTRODUCTION

1.1 PROJECT SUMMARY

Burns and McDonnell Waste Consultants, Inc. (BMWCI) of Kansas City, Missouri, conducted a groundwater evaluation investigation between May 1 and 8, 1996, on behalf of Amoco Pipeline (Amoco) at the Xylene Site in Hammond, Indiana. The Xylene Site is located at the southeast corner of Calumet Avenue and 129th Street in Hammond, Indiana (Figure 1). In September 1992, an estimated 12,180 gallons of free phase xylene (FPX) was released at the Xylene Site. In order to determine the approximate extent of the FPX release in the vicinity of the Xylene Site, the Indiana Department of Environmental Management (IDEM) and Amoco negotiated a Corrective Action Agreed Order (AO). The groundwater evaluation was conducted to satisfy the requirements outlined in the Xylene Site entered into by Amoco and IDEM on October 23, 1995. The AO was developed to establish corrective or remedial actions that Amoco will implement to address the potential impact of the xylene release on public health and the environment.

1.2 SUMMARY OF SITE LOCATION AND USE

The Xylene Site is located in the City of Hammond which is located in the northwestern portion of Indiana in Lake County. The legal description of the Xylene Site is NW 1/4 of the SW 1/4, Section 18, Township 37 North, Range 9 West (see Figure 1).

Land use in the vicinity of the Xylene Site is industrial. The Xylene Site is approximately 250 feet east-southeast of the intersection of Calumet Avenue and 129th Street, and located in the northern portion of the Amoco's Calumet Avenue Warehouse property. The Xylene Facility is used as a booster station for the pumping and distribution of xylene to off-site facilities.

1.3 ABBREVIATED SITE HISTORY

An abbreviated Xylene Site history relating to the FPX release at the Xylene Site is chronicled below:

- On September 6, 1992, an estimated 12,180 gallons of FPX was released at the Xylene Site. Amoco notified the IDEM Office of Environmental Response after detection of the release.
- In November 1992, BMWCI provided oversight for the installation of a series of piezometers at the Xylene Site. The piezometers were installed to gather physical samples and provide information for the design of a future recovery system, and to delineate the approximate extent of FPX associated with the release.
- In April 1993, BMWCI provided oversight for the installation of a 12-inch diameter recovery well (RWX-1) that was installed to a total depth of 20 feet below ground surface (bgs). The recovery well was installed to provide gradient control that would mitigate further xylene plume migration, and to recover FPX.
- October 23, 1995, Amoco and IDEM entered into the Corrective Action Agreed Order for the Xylene Site.
- In January 1996, BMWCI supervised the drilling and installation of 32 wellpoint/vacuum recovery device (VRD) wells along the northern and western fencelines of the Xylene Site. The wellpoint/VRD system was installed to provide further gradient control and enhance FPX recovery at the Xylene Site.

- On May 29, 1996, the construction of the wellpoint/VRD system was completed and the system started.

This report summarizes the groundwater evaluation investigation at the Xylene Site conducted by BMWCI personnel between May 1 and 8, 1996, and includes: field activities and observations; laboratory analytical results of surface soil and groundwater samples; and conclusions and recommendations.

* * * * *

2.0 GROUNDWATER EVALUATION ACTIVITIES

2.1 FIELD ACTIVITIES

Groundwater evaluation field activities were conducted at the Xylene Site between May 1 and May 8, 1996. Groundwater evaluation field activities included providing oversight during utility locating, collecting subsurface soil samples utilizing a truck-mounted drill rig, conducting air monitoring for health and safety purposes, installing permanent groundwater monitoring wells, development of monitoring wells, decontaminating sampling equipment, and collecting groundwater samples from the monitoring wells. Descriptions of the field activities and procedures are provided in the following subsections.

2.2 DRILLING ACTIVITIES

2.2.1 Utility Location

Prior to the commencement of the groundwater evaluation field investigation, representatives of utilities (water supply, sewer, process sewer, electric, gas, telephone, etc.) in the area of the proposed investigation located the utility lines and depths at the Xylene Site. The representatives of the public utilities marked the utility lines prior to commencement of the field activities. Amoco representatives also located utility and process lines associated with Amoco operations at the Xylene Site prior to commencement of the field activities. The location of utilities at the Xylene Site are illustrated on Figure 2.

2.2.2 Decontamination of Drilling and Sampling Equipment

Drilling equipment was decontaminated by the drilling contractor (Fox Drilling of Itasca, Illinois) at a decontamination pad prior to drilling each borehole. The drilling equipment was

decontaminated using a high pressure hot water spray and rinse. All other equipment (split barrel sampler, bolts, etc.) that entered the borehole was decontaminated using a non-phosphate detergent wash and a potable water rinse.

The non-disposable sampling equipment was decontaminated by BMWCI personnel prior to being used. The decontamination procedures consisted of a non-phosphate detergent wash (e.g. Liquinox), potable water rinse, a distilled water rinse, and a HPLC-grade isopropanol rinse. The sampling equipment was allowed to air dry prior to each use. New, disposable equipment was rinsed with distilled water prior to use.

All investigative generated waste (soil cuttings, decontamination fluids, etc.) was containerized and managed as described in Subsection 2.8 of the IDEM approved Groundwater Evaluation Study Plan (GESP) dated December 1995.

2.2.3 Subsurface Soil Sampling

A total of five soil borings (JLM029A, JLM029, JLM030, JLM031, and JLM032) were drilled and sampled to delineate the approximate extent of xylene in the soil and groundwater at the Xylene Site (see Figure 3). Soil Boring JLM029A was abandoned after 10 feet of drilling because free phase hydrocarbon was present in the soil boring. Based on the location of Soil Boring JLM029A, it was possible the free phase hydrocarbons encountered could be associated with the hydrocarbon plume located south of Xylene Site and currently included as part of the Amoco and IDEM negotiated Agreed Order associated with Amoco refinery and J&L Site. Therefore, the soil boring was terminated and backfilled with bentonite, and no soil samples were submitted for laboratory analysis. Soil Boring JLM029 was completed near the southern fenceline of the Xylene Site to replace Soil Boring JLM029A and delineate the presence of xylene to the south of the Xylene Site.

Soil Borings JLM029, JLM030, JLM031, and JLM032 were drilled to approximately 17 feet bgs.

A soil sample collected from each of these borings was submitted to a laboratory for analysis, and each boring was converted to a monitoring well. The rationale for the drilling locations is based on the known location of the xylene release and the direction of groundwater flow at the Xylene Site. The boring locations were determined in the field prior to drilling, based on utility location and accessibility (see Figure 3).

The soil borings were drilled between May 1 and 3, 1996, by Fox Drilling of Itasca, Illinois. A CME 55 all terrain vehicle drill rig was used so that traffic control and additional support for drilling equipment was not necessary in the area between the Xylene Site and 129th Street. BMWCI personnel monitored the borehole for organic vapors using a photoionization detector (PID), equipped with a 10.6-electron volt (eV) lamp (or greater), and for lower explosive limit (LEL) using a MSA 260 combustible gas indicator. The measurements were recorded on the drilling logs (see Appendix A).

Soil samples were obtained from the borings continuously until reaching the water table, using standard penetration test split-barrel samplers. Upon reaching the water table, soil samples were collected on 5-foot centers until reaching the total depth of the soil boring (approximately 17 feet bgs). Once the soil sample was removed from the borehole, the split-barrel sampler was opened and the soil was visually examined for staining and discoloration. The soil samples were field screened using a PID immediately after removal from the borehole to detect volatile organic compounds (VOCs) within the soil matrix. A decontaminated, stainless steel knife was used to remove the outer layer of soil and transfer the selected soil sample from the sampling device to a sample container for laboratory chemical analyses, if appropriate, and to a quart glass jar which was sealed with a septum-type lid for head space measurement. The soil sample to be submitted for laboratory analysis was immediately placed in a cooler containing ice. The head space sample was warmed for 5 to 10 minutes in an area that was 60 to 80 degrees Fahrenheit. Head space readings for each soil sample were recorded by inserting the PID probe through the

septum-type lid. The head space readings were recorded on the boring logs. The subsurface soil sample that was submitted for laboratory analysis was collected from the interval in the soil boring with the highest head space reading located above the groundwater table. A total of four subsurface soil samples were submitted to the laboratory for analyses.

In addition to the four subsurface soil samples, quality assurance/quality control (QA/QC) samples were collected. The QA/QC samples consisted of a duplicate sample, labeled JLM031-6 which was collected at the same time and location as Soil Sample JLM031-1. Matrix spike and matrix spike duplicate (MS/MSD) samples were collected at the same time and location as Soil Sample JLM032-1. An equipment rinsate blank (JLM031-ERB) was collected from the high performance liquid chromatography (HPLC) grade water rinse obtained from the decontaminated split barrel sampler used during the drilling of Soil Boring JLM031. Trip blanks accompanied each sample container from and to the laboratory.

The samples were clearly labeled and immediately placed in a cooler containing ice. Standard Chain-of-Custody procedures were followed throughout the sampling event and during shipment of the samples to IEA, Inc. in Schaumburg, Illinois. The subsurface soil and QA/QC samples were analyzed for xylene using United States Environmental Protection Agency (USEPA) Method 8020.

The subsurface materials encountered in each boring were classified in the field and recorded on the drilling logs (see Appendix A). The classification procedure included textural descriptions of the soils in accordance with the Unified Soil Classification System (USCS). In addition, the field classifications included principal and minor soil constituents, soil colors, and other visible features, such as structure and sedimentary features.

2.3 MONITORING WELL INSTALLATION AND DEVELOPMENT

2.3.1 Monitoring Well Installation

Soil Borings JLM029, JLM030, JLM031, and JLM032 were completed as monitoring wells by Fox Drilling between May 1 and 3, 1996, with oversight provided by BMWCI personnel. Each monitoring well was constructed of 2-inch OD, flush joint, threaded, Schedule 5, stainless steel casing with the lower 15 feet consisting of 10-slot (0.010-inch opening) screen. Due to the shallow water table at the Site, the well screens were installed just above the water table. The remaining portion of the 15 foot screen was below the water table. The filter pack was installed to approximately 0.25 to 0.5 feet above the top of the well screen with at least a 1-foot thick bentonite pellet seal on top of the filter pack. Fresh, potable water was added to the top of the bentonite to allow for proper swelling of the bentonite. The remaining annular space was filled with a flush-mount protective cover and cement grout. A locked, water tight, expandable plug was installed in the top of the monitoring well casing. Well construction diagrams for the four monitoring wells are included in Appendix B.

2.3.2 Monitoring Well Development

All monitoring wells were developed using a new, disposable, polyethylene bailer tied with polypropylene rope. A minimum of five well volumes were removed from each monitoring well. Temperature, pH, specific conductivity, and visual turbidity were measured throughout well development. The purged water was managed as discussed in Subsection 2.8 of the IDEM approved Groundwater Evaluation Study Plan dated December 1995.

2.4 GROUNDWATER SAMPLING

A groundwater sample was collected from newly installed Monitoring Wells JLM030, JLM031, and JLM032, and existing Monitoring Well PZX-1 on May 8, 1996 by BMWCI personnel. Newly installed Monitoring Well JLM029, and existing Monitoring Wells PZX-1, PZX-2, PZX-3, PZX-4, PZX-5, PZX-6, PZX-7, and PZX-8 were not sampled because FPX was encountered. Existing Monitoring Well PZX-9 was not sampled because the screen interval is below the groundwater table.

Prior to purging each monitoring well, fluid levels and total well depth (see Table 1) were measured and an initial groundwater sample was collected to measure pH, specific conductance, and temperature. In addition, color, odor, and visual turbidity were noted. A minimum of three well volumes of water were purged from each monitoring well using a new, disposable polyethylene bailer and polypropylene rope. The pH, specific conductivity, and temperature were also monitored throughout the purging process. After each monitoring well was properly purged, a groundwater sample from each well was collected and submitted for laboratory analysis.

In addition to the 4 groundwater samples, quality assurance/quality control (QA/QC) samples were also collected. A duplicate sample, labeled PZX-0 GW-1 was collected at the same time and locations as Groundwater Sample PZX-1. Matrix spike and matrix spike duplicate (MS/MSD) samples were collected at the same time and location as Groundwater Sample JLM032 GW-1. An equipment rinsate blank was also collected by sampling the high performance liquid chromatography (HPLC) grade water rinse obtained from the disposable bailer used at Monitoring Well JLM031. A trip blank accompanied the sample containers and cooler from and to the laboratory.

Each groundwater and QA/QC sample was placed in new, laboratory-cleansed sample containers without any head space, wrapped with protective bubble wrap, and placed in a cooler containing ice. Immediately after collection, the groundwater samples were sent to IEA Laboratory in Schaumburg, Illinois, following proper Chain-of-Custody procedures, and analyzed for xylene using USEPA Method 8020.

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3.0 SITE GEOLOGY

3.1 SITE GEOLOGY

The site is located on the relatively low relief Calumet Lacustrine Plain. The regional surficial geology (Calumet Aquifer) consists of fine to medium grained sand which is locally overlain by manmade fill composed of reworked natural sand mixed with gravel, rubble, and steel mill slag. Thin lenses of peat, usually less than one foot thick, have been encountered during other drilling efforts in this natural sand layer. Total aquifer thickness ranges from 0 to 65 feet. The aquifer is underlain by a mantle of till and lacustrine clay about 100 feet thick that overlies carbonate bedrock of Silurian age (USGS 1989).

During the field activities, five soil borings were extended to approximately 10 to 17 feet bgs. A dark brown topsoil was encountered in the top 0.5 to 1.5 feet of the soil borings. A dense slag was encountered beneath the topsoil in three of the five soil borings and ranged in thickness of 0.4 to 3.2 feet. A medium to fine sand extended from beneath the topsoil or slag layer to the total depth of the soil borings which became increasingly fine and silty with depth. The sand became a fine grained sand with silts toward the lower portion of the soil borings. An east-west geologic cross section location is illustrated on Figure 3. A cross section showing the subsurface stratigraphy encountered in the soil borings completed as part of the groundwater evaluation investigation and borings completed as part of previous investigations is illustrated on Figure 4.

3.2 SITE HYDROGEOLOGY

The shallow aquifer system beneath the Xylene Site is known as the Calumet Aquifer and consists of alluvial, lacustrine, and aeolian sand and gravel. During the field activities, groundwater was encountered in the soil borings at a depth of 0.95 to 3.0 feet bgs in the

unconsolidated fill and sand. Recharge to the Calumet Aquifer is primarily through infiltration after precipitation events.

Fluid levels were measured in the thirteen monitoring wells (new and existing) at and near the Xylene Site on two occasions during the groundwater evaluation field activities. The fluid levels are summarized on Table 1. Based on the fluid level elevations collected on May 8, 1996, the groundwater gradient at the Xylene Site appears to be relatively flat (see Figure 5). Groundwater elevation data collected from the Xylene and J&L Sites in the past indicate an overall regional groundwater flow toward the north. The discharge point for the groundwater associated with the Xylene Site is Lake George, located approximately 1400 feet north of the Xylene Site. In addition, the shallow drainage ditch along the south side of 129th Street could periodically act as a discharge point.

On May 29, 1996, the wellpoint/VRD system located along the north and west fencelines of the Xylene Site was started. Operation of the recently installed wellpoint/VRD system is expected to influence the groundwater gradient in the area of the Xylene Site.

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4.0 INVESTIGATION RESULTS

4.1 SAMPLE SCREENING AND ANALYTICAL RESULTS

Four subsurface soil samples, four groundwater samples, and associated QA/QC samples were collected during the groundwater evaluation investigation to determine the approximate extent of xylene in the soil and groundwater beneath the Xylene Site. The soil samples were field analyzed for headspace using a PID (Foxboro OVM 580B) and laboratory analyzed for xylene using USEPA Method 8020. The following sections detail the sample screening and analytical results.

4.1.1 Subsurface Soil Screening and Analytical Results

As described in Section 2.2.3, all subsurface soil samples were field screened using a PID immediately after removal from the borehole to detect volatile organic compounds within the soil matrix. The headspace readings of the subsurface samples ranged between 84 and 2803 parts per million (ppm). The headspace readings were recorded on the drilling logs (see Appendix A)

The soil samples submitted for laboratory analysis were collected from 1 to 4 feet bgs. The shallow sample interval was due to the shallow groundwater table encountered at the Xylene Site. The subsurface soil samples were analyzed for total xylene using USEPA Method 8020. Total xylene was detected in three of the four subsurface soil samples. The concentrations varied from below the detection limit in Soil Sample JLM030-1 (2 to 4 feet bgs) to 2,700,000 micrograms per kilogram (ug/kg) in Soil Sample JLM029-1 (1 to 3 feet bgs). The elevated xylene level in Soil Sample JLM029-1 may be attributed to the FPX encountered in the boring. The xylene concentrations in the soil are illustrated on Figure 6. The analytical results are tabulated in Table 2 and the laboratory analytical reports are included in Appendix C.